

What is claimed is:

1. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:
 - 5 an internal combustion engine incorporated in a vehicle body having drive wheels;
 - an AC generator incorporated in said vehicle body and driven by said internal combustion engine;
- 10 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and
 - 15 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,
- 20 wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and
 - 25 a displacement sensor that can detect movement of said vehicle body is provided,
- 25 said method comprises steps of:
 - gradually increasing the intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is

monitored when said control mode for generating electric power is selected ,and

5 determining that said power transmission device is in the state of transmitting power when said displacement sensor detects movement of said vehicle body in the step of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when said displacement sensor does not detect movement of said vehicle body before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the step of gradually 10 increasing said intake air amount.

2. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power 15 transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

20 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

25 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

5 a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle is used as a displacement sensor, and

said method comprises steps of:

10 gradually increasing an intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is monitored when said control mode for generating electric power is selected, and

15 determining that said power transmission device is in the state of transmitting power when generation of the vehicle speed pulse by said vehicle speed sensor is detected in the process of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when generation of the vehicle speed pulse by the vehicle speed sensor is not detected before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the 20 process of gradually increasing said intake air amount.

3. A transmission state determination method of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power 25 transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

5 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said 10 generator when the control mode for generating electric power is selected by said mode selection means,

wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine 15 and said drive wheels, and

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle is used as a displacement sensor, and

said method comprises steps of;

20 gradually increasing a intake air amount of said internal combustion engine while a rotational speed of said internal combustion engine is monitored when said control mode for generating electric power is selected, and

determining that said power transmission device is in the state of 25 transmitting power when a vehicle speed obtained from said vehicle speed pulse reaches a set determination reference value or higher in the process of gradually increasing said intake air amount, and that said power transmission device is in the state of cutting power transmission when the

vehicle speed obtained from said vehicle speed pulse does not reach said set determination reference value before the rotational speed of said internal combustion engine exceeds a preset reference rotational speed in the process of gradually increasing said intake air amount.

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4. A transmission state determination device of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

10 an internal combustion engine incorporated in a vehicle body having drive wheels;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

15 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

20 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

25 wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

said transmission state determination device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a displacement sensor that detects movement of said vehicle body;

intake air amount control means for determining transmission state for 5 controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means; and

determination means for determining that said power transmission device is in the state of transmitting power when said displacement sensor 10 detects movement of said vehicle body in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in the state of cutting power transmission when said displacement sensor does not detect movement of said vehicle body before the rotational speed 15 detected by said rotational speed detection means exceeds a set reference rotational speed in the process of gradually increasing said intake air amount.

5. A transmission state determination device of a power transmission 20 device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

25 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

5 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

10 wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

said transmission state determination device comprises:

15 rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle;

20 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means; and

25 determination means for determining that said power transmission device is in the state of transmitting power when said vehicle speed pulse is detected in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in the state of cutting power transmission when said vehicle speed pulse is not detected before the

rotational speed detected by said rotational speed detection means exceeds a reference rotational speed in the process of gradually increasing said intake air amount.

5 6. A transmission state determination device of a power transmission device for an internal combustion engine driven vehicle for determining whether said power transmission device is in a state of cutting power transmission or a state of transmitting power, said vehicle comprising:

10 an internal combustion engine incorporated in a vehicle body having drive wheels;

 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

15 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

20 a generation control unit having rotational speed control means for generating electric power for controlling an intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

25 wherein said power transmission device has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism and is provided between a crankshaft of said internal combustion engine and said drive wheels, and

 said transmission state determination device comprises:

 rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a vehicle speed pulse for each rotation of an axle of said vehicle through a certain angle;

intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means; and

determination means for determining that said power transmission device is in the state of transmitting power when a vehicle speed obtained from said vehicle speed pulse reaches a set determination reference value or higher in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in the state of cutting power transmission when the vehicle speed obtained from said vehicle speed pulse does not reach said determination reference value before the rotational speed of said internal combustion engine exceeds a predetermined reference rotational speed in the process of gradually increasing said intake air amount.

7. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

a power transmission device that has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the internal combustion engine reaches a predetermined power transmission

start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

5 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

10 a generation control unit having rotational speed control means for generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by
15 said mode selection means,

wherein said runaway prevention device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a displacement sensor that detects movement of said vehicle body;

20 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

determination means for determining that said power transmission
25 device is in a state of transmitting power when said displacement sensor detects movement of said vehicle body in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is

in a state of cutting power transmission when said displacement sensor does not detect movement of said vehicle body before the rotational speed detected by said rotational speed detection means exceeds a set reference rotational speed in the process of gradually increasing said intake air amount; and

5 safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

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8. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount to an idle air amount when said determination means determines that said power transmission device is in the state of transmitting power.

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9. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of means for stopping an ignition operation of said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

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10. The runaway prevention device of the internal combustion engine driven vehicle according to claim 7, wherein said safety means is comprised of means for stopping supply of fuel to said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

11. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

5 an internal combustion engine incorporated in a vehicle body having drive wheels;

 a power transmission device that has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the
10 internal combustion engine reaches a predetermined power transmission start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

 an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

15 an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

 mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

20 a generation control unit having rotational speed control means for generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by
25 said mode selection means,

 wherein said runaway prevention device comprises:

 rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a plurality of vehicle speed pulses for one rotation of an axle of said vehicle;

intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of
5 said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

determination means for determining that said power transmission device is in a state of transmitting power when said vehicle speed pulses are detected in the process of gradually increasing said intake air amount by said
10 intake air amount control means for determining transmission state, and that said power transmission device is in a state of cutting power transmission when said vehicle speed pulses are not detected before the rotational speed detected by said rotational speed detection means exceeds a set reference rotational speed in the process of gradually increasing said
15 intake air amount; and

safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that
20 said power transmission device is in the state of transmitting power.

12. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount to an idle air amount when said determination means determines that said
25 power transmission device is in the state of transmitting power.

13. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for stopping an ignition operation of said internal combustion engine when said determination means determines that said power
5 transmission device is in the state of transmitting power.

14. The runaway prevention device of the internal combustion engine driven vehicle according to claim 11, wherein said safety means is comprised of means for stopping supply of fuel to said internal combustion engine when
10 said determination means determines that said power transmission device is in the state of transmitting power.

15. A runaway prevention device of an internal combustion engine driven vehicle for preventing runaway of said internal combustion engine driven
15 vehicle when a control mode for generating electric power is selected, said internal combustion engine driven vehicle comprising:

an internal combustion engine incorporated in a vehicle body having drive wheels;

20 a power transmission device that has a transmission with a gear position for cutting power transmission and an automatic clutch mechanism that enters a state of transmitting power when a rotational speed of the internal combustion engine reaches a predetermined power transmission start rotational speed or higher, and is provided between a crankshaft of said internal combustion engine and said drive wheels;

25 an actuator that operates means for adjusting an intake air amount of said internal combustion engine;

an AC generator incorporated in said vehicle body and driven by said internal combustion engine;

mode selection means for selecting a control mode of said internal combustion engine between a control mode for driving vehicle and a control mode for generating electric power; and

5 a generation control unit having rotational speed control means for generating electric power for controlling the intake air amount of said internal combustion engine so as to rotate said internal combustion engine at a rotational speed required for generating predetermined power from said generator when the control mode for generating electric power is selected by said mode selection means,

10 wherein said runaway prevention device comprises:

rotational speed detection means for detecting a rotational speed of said internal combustion engine;

a vehicle speed sensor that generates a plurality of vehicle speed pulses for one rotation of an axle of said vehicle;

15 intake air amount control means for determining transmission state for controlling said actuator so as to gradually increase the intake air amount of said internal combustion engine when the control mode for generating electric power is selected by said mode selection means;

20 determination means for determining that said power transmission device is in a state of transmitting power when a vehicle speed obtained from said vehicle speed pulses reaches a set determination reference value or higher in the process of gradually increasing said intake air amount by said intake air amount control means for determining transmission state, and that said power transmission device is in a state of cutting power transmission when the vehicle speed obtained from the vehicle speed pulses does not reach said determination reference value before the rotational speed of said internal combustion engine exceeds a predetermined reference rotational speed; and

safety means for controlling said internal combustion engine so as to return the rotational speed of said internal combustion engine to a rotational speed less than said power transmission start rotational speed or to stop said internal combustion engine when said determination means determines that 5 said power transmission device is in the state of transmitting power.

16. The runaway prevention device of an internal combustion engine driven vehicle according to claim 15, wherein said safety means is comprised of means for controlling said actuator so as to return said intake air amount 10 to an idle air amount when said determination means determines that said power transmission device is in the state of transmitting power.

17. The runaway prevention device of an internal combustion engine driven vehicle according to claim 15, wherein said safety means is comprised 15 of means for stopping an ignition operation of said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.

18. The runaway prevention device of an internal combustion engine 20 driven vehicle according to claim 15, wherein said safety means is comprised of means for stopping supply of fuel to said internal combustion engine when said determination means determines that said power transmission device is in the state of transmitting power.